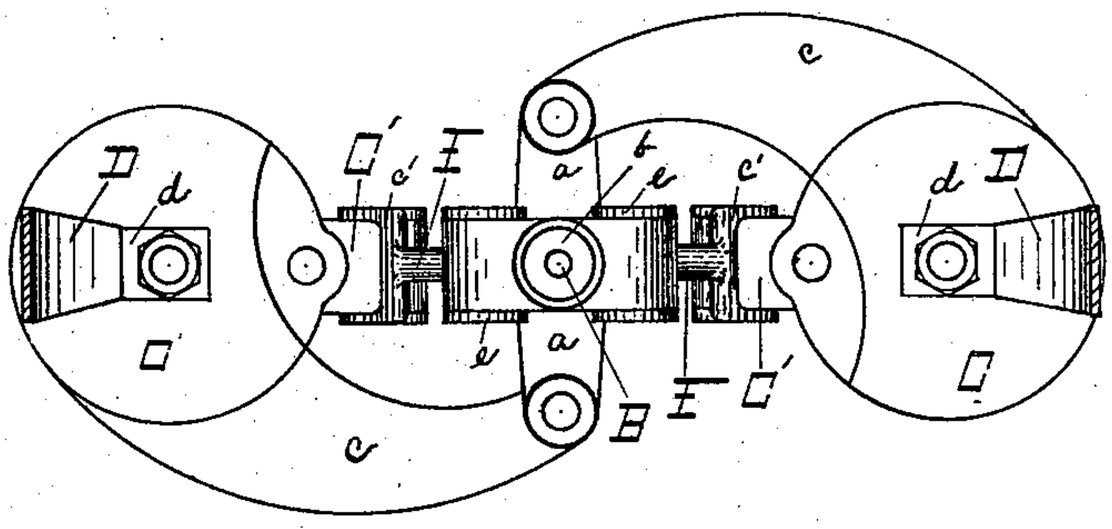
(No Model.) 2 Sheets—Sheet 1.

F. H. & B. C. BALL.

ENGINE GOVERNOR.

No. 601,009. Patented Mar. 22, 1898.

Fig. 1.



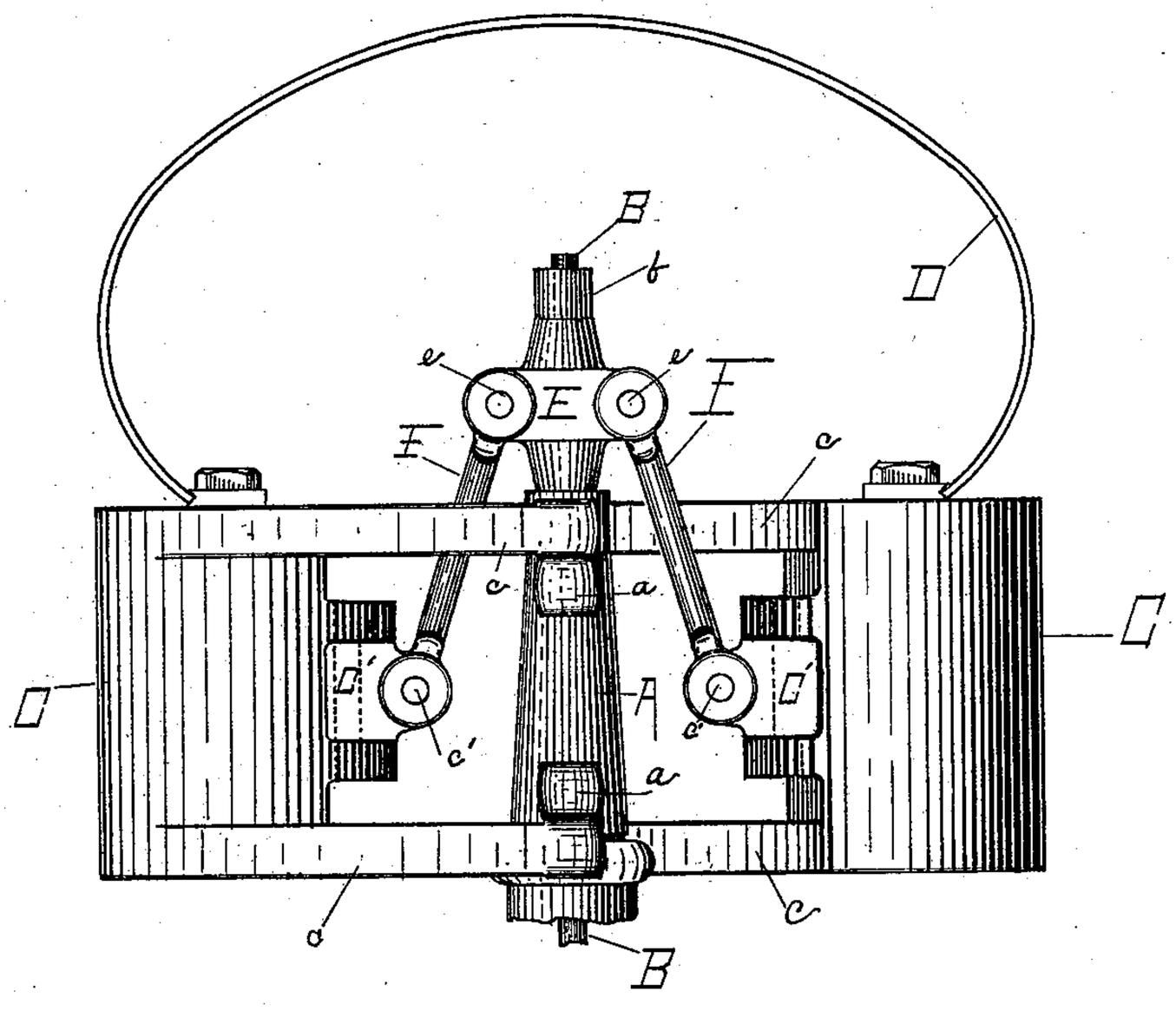


Fig. 2.

WITNESSES:
A. J. Olson
James Brady.

INVENTORS.
Frank H. Ball
and
Burt C. Ball
BY
H. C. Lund
ATTORNEY.

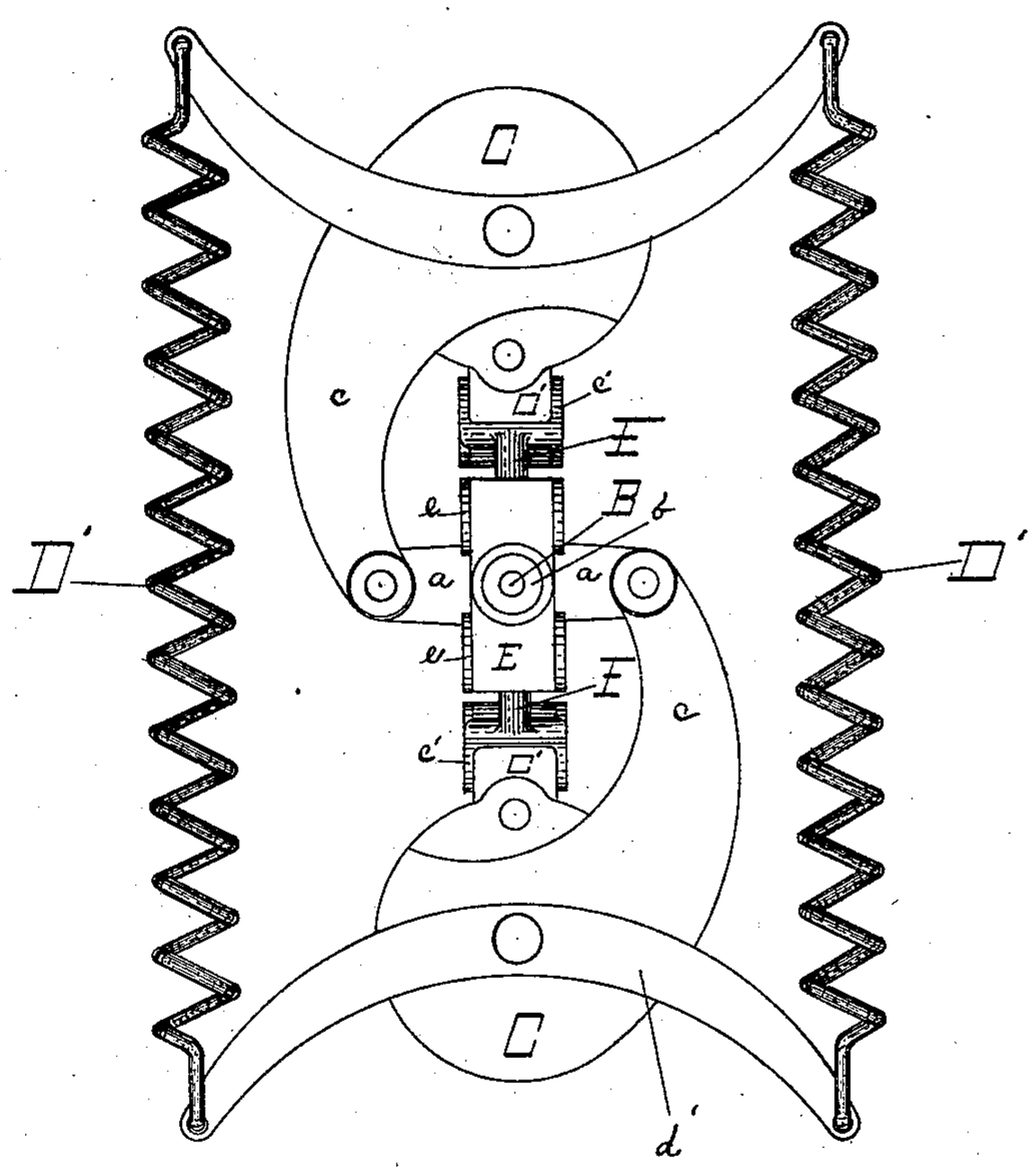
(No Model.) 2 Sheets—Sheet 2.

F. H. & B. C. BALL.

ENGINE GOVERNOR.

No. 601,009. Patented Mar. 22, 1898.

Fig. 3.



WITNESSES:

C. J. Olson

James Brady.

INVENTORS

Frank H. Ball

and

Bert C. Ball

BY N. C. Lord.

ATTORNEY.

UNITED STATES PATENT OFFICE.

FRANK H. BALL AND BERT C. BALL, OF PLAINFIELD, NEW JERSEY.

ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 601,009, dated March 22, 1898.

Application filed September 20, 1897. Serial No. 652,291. (No model.)

To all whom it may concern:

Be it known that we, FRANK H. BALL and BERT C. BALL, citizens of the United States, residing at Plainfield, in the county of Somerset and State of New Jersey, have invented certain new and useful Improvements in Engine-Governors; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to engine-governors; and it consists in certain improvements in the construction thereof, as will be hereinafter fully described, and pointed out in the claims.

More particularly the invention relates to that class of governors which act through a throttling-valve or indirectly upon the main valve or other regulator as distinguished from what is commonly known as a "shaft-governor."

The invention is illustrated in the accompanying drawings, as follows:

Figure 1 shows a plan of the governor. Fig. 2 shows a side elevation. Fig. 3 shows an alternative construction.

A marks the rotative carrier; B, the regulator-rod, which effects a governing action by oscillating or reciprocating movement, but which may be said to be normally at rest as distinguished from the valve-moving action of the regulators of shaft-governors.

The weights C are provided with the arms *c*, by means of which they are pivoted to arms *a* on the rotative carrier, and they are preferably symmetrically shaped and placed at opposite sides of the carrier.

A T-block E is secured on the regulator-rod B by means of a washer or nut *b*. Links F are pivoted at *e* to this T-block. Blocks C′ are pivoted in the weights C, and the links F pivoted at *c′* to the blocks C′. It will readily be seen that the oscillatory movement of the weights is communicated by means of the links and incident mechanism to the regulator-rod and that a reciprocating movement is effected in the regulator-rod thereby.

A spring D engages the pivoted blocks *d* on the weights and forms the centripetal element of the governor. The spring extends up over the center of the carrier, and the line of its pull is approximately through the axis of rotation of the carrier. This arrangement allows a perfectly symmetrical construction of the parts. The line of the pull of the spring is also directly opposed to the centrifugal force of the weight, so that the centripetal value of the spring is simply its direct force, by reason of which the parts may be readily and exactly adjusted for all positions, and where the spring pulls approximately from or through the centers of gravity of the weights the friction on the pivots is practically eliminated.

It is desirable that the spring should be arranged to approximately effect what is known as "theoretical tension"—that is, an arrangement of the spring which will give at a predetermined speed a centripetal moment equal in all positions of the weights to the centrifugal moment of the weights in corresponding positions. To effect this with the pull of the spring through the axis of the carrier and from or through the center of gravity of the weights, it is necessary in the construction shown that the spring be longer than the distance between the centers of gravity. If exact theoretic tension is desired under these conditions, the contractive capacity of the spring having a uniform scale of strength must be equal to the distance between the centers of gravity. By making the spring longer than the distance between the centers of gravity, therefore, a more efficient governor can be obtained than is possible with a construction having a spring shorter than the distance between the centers of gravity, because with the latter construction theoretic tension or slight variations from it, as desired, cannot well be obtained. By forming the spring so that it forms a medium of connection between the weights an exactly equal pull on both weights is assured, so that pressure on the links, which would be present were the pull on the weights unequal, is eliminated.

In Fig. 3 we have shown an alternative construction in which coil-springs D′ are used. These are secured to blocks *d′*, which are pivoted on the weights and extend outwardly from the center of gravity, so that the springs are longer than the distance between centers of gravity. We prefer, however, the con-

struction shown in Figs. 1 and 2, because centrifugal force does not cause a disturbing influence on the spring.

A part of the mechanism herein shown forms the subject-matter of a separate application filed by us December 7, 1896, and serially numbered 614,696.

What we claim as new is—

1. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by oscillatory or reciprocating movement but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights and arranged with a capacity for approximately theoretic tension.

2. In a governor of the type described the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by an oscillatory or reciprocating movement but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights and arranged with a capacity for approximately theoretic tension and with its pull in a line approximately through the centers of gravity of the weights.

3. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by an oscillatory or reciprocating movement but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights and arranged with a capacity for approximately theoretic tension, and with its pull approximately in a line through the axis of the carrier.

4. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by an oscillatory or reciprocating movement, but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights, and arranged with a capacity for approximately theoretic tension, and with its pull in a line approximately through the centers of gravity of the weights and the axis of the carrier.

5. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by an oscillatory or reciprocating movement, but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights, and arranged with a capacity for approximately theoretic tension, and with the body of the spring in a plane containing the axis of the carrier.

6. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by oscillatory or reciprocating movement, but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights, said spring being longer than the distance between the centers of gravity of the weights.

7. In a governor the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by oscillatory or reciprocating movement, but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights, and arranged with its pull in a line approximately through the centers of gravity of the weights, said spring being longer than the distance between the said centers of gravity.

8. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of the carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by oscillatory or reciprocating movement, but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights, and arranged with its pull in a line approximately through the axis of the carrier, said spring being longer than the distance between the centers of gravity of the weights.

9. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the pivots substantially parallel with the axis of the carrier; a regulator operated by oscillatory or reciprocating movement, but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights, and arranged with its pull in a line approximately through the centers of gravity of the weights and the axis of the carrier, said spring being longer than the distance between the said centers of gravity.

10. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of said carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by oscillatory or reciprocating movement, but normally at rest; means for communicating the movement of the weights to the regulator; and a centripetally-acting spring forming a medium of connection between the weights and arranged with its pull in a line approximately through the axis of the carrier and with the body of the spring in a plane containing the axis of the carrier, said spring being longer than the distance between the centers of gravity of the weights.

11. In a governor of the type described, the combination of a rotative carrier; two weights pivoted on opposite sides of the carrier with the axis of the pivots substantially parallel with the axis of the carrier; a regulator operated by reciprocating or oscillatory movement, but normally at rest; mechanism for communicating the movement of the weights to the regulator; and a spring D engaging the weights and extending over the governor mechanism, the body of the spring being in a plane containing the axis of the carrier.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANK H. BALL.
BERT C. BALL.

Witnesses:
AUSTIN R. PRESTON,
MAULSBY KIMBALL.